Methodology for the development of physical and technical training in handball players at the initial preparatory stage

https://doi.org/10.65149/eajss.2026.v6i4.a002

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Abstract

The purpose: This article provides a detailed account of the data obtained from the practical implementation of a methodology for the systematic application of a training program aimed at developing the physical and technical preparedness of handball players at the initial training stage.

Methods: Pedagogical tests and control exercises were employed, including: analysis of scientific and methodological literature, pedagogical observation, research organization, pedagogical experimentation, mathematical and statistical methods, and analysis of the obtained results.

Results: A general analysis of the main statistical characteristics of physical fitness indicators in handball players at the initial training stage, based on results recorded at the beginning and end of the study, is as follows: In the experimental group, the result for the 30-meter run was 5.8±0.6 seconds at the start of the experiment and 5.2±0.4 seconds at the end ($t=4.6$; $P<0.001$). The result for the standing long jump was 156.5±10.7 cm at the start and 179.2±9.4 cm at the end ($t=6.4$; $P<0.001$). For the triple jump, the result was 418.5±13.2 cm at the start and 472.4±16.5 cm at the end ($t=6.2$; $P<0.001$). The result for the standing right-handed handball throw was 11.2±1.3 m at the start and 12.2±0.8 m at the end ($t=4.9$; $P<0.001$). The result for the standing left-handed handball throw was 6.8±0.9 m at the start and 7.9±0.7 m at the end ($t=4.1$; $P<0.001$). The result for the seated two-handed handball throw was 7.1±0.3 m at the start and 7.6±0.8 m at the end ($t=3.5$; $P<0.01$). In the 7-stage 40-meter shuttle run test, the result was 31.9±2.5 at the start of the experiment and 28.1±2.2 at the end ($t=6.1$; $P<0.001$). This indicates that statistically significant differences were observed in the general physical fitness test results between the beginning and end of the experiment, which substantiates the high effectiveness of the developed methodology.

Conclusion: Current research and pedagogical observations have shown that in a study conducted to determine the physical fitness of middle-distance runners, no significant difference was observed in the physical fitness levels of the experimental and control group subjects. However, a comparative analysis of the results obtained at the beginning of this study revealed that the athletic form of the athletes in both the experimental and control groups was not sufficiently developed.

Keywords: Training sessions, physical preparation, technical preparation, sport specialization, means, method.

Introduction

Globally, adequate simulation of the sport of handball is enabling new knowledge about the structure of the game and the specific characteristics of the interaction between its elements. In modern sports, it is observed that athletic achievements grow not as a result of a single type of training, but as a result of increasing the level of comprehensive preparation [1, 2, 5].

Scientific research has been conducted on the use of modeling methods in sports, the development of modern programs that allow for the simulation of gameplay in handball, and specifically, the optimization of training loads for field players. A need is emerging to develop the scientific and methodological foundations for training goalkeepers in handball training groups [3, 4].

Methods

Pedagogical tests and control exercises were employed, including: analysis of scientific and methodological literature, pedagogical observation, research organization, pedagogical experimentation, mathematical and statistical methods, and analysis of the obtained results.

Results and discussion

In the initial training stage for handball players, the first year's total load is 312 hours, while the second year's total load is 416 hours. These groups will consist of athletes aged 10-11. The objectives for this group are as follows: to strengthen health, ensure comprehensive physical development, and master the technical elements of track and field

The initial training stage is aimed at creating a foundation of physical preparedness for handball players, which involves developing their general motor potential, muscular strength, agility, and endurance. During this period, athletes do not yet deeply master complex techniques but rather prepare their bodies for the sport. Training sessions primarily include dynamic games, general developmental exercises, basic ball handling, and tasks related

to teamwork. This stage incorporates general physical preparedness, special physical preparedness, and assessment processes.

General physical preparation is the main component of this stage, comprising a set of exercises aimed at improving an athlete's overall condition and developing physical qualities (strength, endurance, agility, flexibility, speed). It is at this stage that the following exercises are performed:

-simple and varied forms of running (on flat surfaces, over obstacles, interval running);

-basic gymnastic exercises (stretching, bending, rotating the body);

-active games (for example: "Tag," "Steal the Ball," "Who's Fastest?");

-tasks performed in pairs and small groups;

-bodyweight exercises (activating the arm, waist, and back muscles).

These exercises help control the heart rate, strengthen general endurance, and build the oxygen delivery system (aerobic base). During this period, it is especially important to increase functional capabilities and improve motor coordination with the external environment.

Special Physical Training (SPT) is a type of training aimed at developing the motor activities specific to a particular sport. Unlike general physical training, it is precisely targeted and focuses on forming special motor skills. In handball, these movements include elements such as passing, catching, running, jumping, stopping, turning, and shooting the ball. During training, the sensory-motor systems are activated, and intermuscular coordination is improved.

- Ball control movements: Catching the ball with both hands, controlling it with one hand, catching it while moving, or dribbling it;

- Passing and shooting: Passing forward, sideways, from a low position, or from overhead; jump shots;

- Stopping, turning, and changing direction: Stopping abruptly from high speed, turning left or right, and using deceptive movements to evade an opponent;

- Jumping: Vertical and horizontal jumps, especially the jumping movements performed before shooting the ball;

- Running and speed control: Starting from a stationary position, sprinting over short distances, and making sudden changes in speed.

These activities develop motor components in children such as hand-eye coordination, reaction speed, precision, and the ability to abruptly change direction while running. At the same time, initial technical skills for dribbling the ball begin to form.

The monitoring stage is a phase of continuous observation, assessment, and adjustment of training based on the results of an athlete's physical, functional, and psychological development during sports practice. It is through this stage that the coach determines the developmental dynamics of each athlete, revises training plans, and identifies individual errors and weaknesses to develop strategies aimed at correcting them. This stage is an integral component of a scientific and pedagogical approach.

The first task of the monitoring stage is to determine the athlete's level of physical development. In this process, anthropometric indicators (height, body weight, degree of chest expansion), heart rate (HR), blood pressure, body temperature, and other physiological signs are measured. These indicators make it possible to assess the overall condition of the athlete's body, their ability to adapt to athletic loads, and their level of healthy development. For athletes aged 9–11 in particular, these indicators are also important in determining the discrepancy between their biological and chronological age.

The second key area is the assessment of motor skills. These skills include speed, agility, strength, flexibility, endurance, and coordination. Each is measured through specific tests. For example, a 10 or 20-meter sprint assesses speed, the "Snake Run" drill assesses agility, throwing a ball at a target assesses accuracy and power, and jumping tests assess lower extremity strength. These tests must be simple, standardized, and age-appropriate.

The third area is determining an athlete's specific technical and functional potential. This involves evaluating the quality, accuracy, speed, and coordination of sport-specific technical movements (e.g., dribbling, throwing the ball, stopping on a run, jump shots). Physiological indicators are also monitored, such as the athlete's recovery rate during and after training (e.g., how quickly their heart rate returns to normal), endurance levels, and reactions to training (e.g., heart rate before/after the session, emotional state).

The fourth area of focus is assessing the athlete's psychological preparedness and resilience. To succeed in sports training, and

Table . Comparative statistical analysis of physical fitness indicators of 10-year-old handball players in the experimental and control groups at the conclusion of the pedagogical experiment.

No.	Indicators		Experimental group n=24				Control group n=24			
			$\bar{X}\sigma\pm$	*V%*	*t*	*P*	$\bar{X}\sigma\pm$	*V%*	*t*	*P*
			Physical Fitness Indicators							
1.	30m run, s	Pre-experiment	6.3±0.4	9.4	4.4	<0.001	6.2±0.4	11.2	1.4	>0.05
		Post-experiment	5.6±0.7	13.2			5.9±0.7	13.2		
2.	Standing long jump, cm	Pre-experiment	147.3±15.7	11.2	5.3	<0.001	150.3±12.6	12.3	2.8	<0.05
		Post-experiment	170.1±10.2	6.4			161.5±6.7	6.1		
3.	Triple jump from standing, cm	Pre-experiment	402.6±16.8	12.3	12.2	<0.001	405.7±10.8	13.3	6.3	<0.001
		Post-experiment	452.3±11.6	2.5			428.1±11.6	2.5		
4.	Standing right-handed handball throw, m	Pre-experiment	9.2±0.8	9.6	5.7	<0.001	9.07±1.2	12.4	1.7	>0.05
		Post-experiment	11.1±0.7	13.8			9.4±0.9	8.4		
5.	Standing left-handed handball throw, m	Pre-experiment	5.5±0.6	13.7	4.2	<0.001	5.7±0.8	14.2	1.3	>0.05
		Post-experiment	6.4±0.5	13.2			5.9±0.4	13.2		
6.	Seated two-handed handball throw, m	Pre-experiment	6.1±0.7	12.9	4.6	<0.001	6.3±0.9	10.8	1.2	>0.05
		Post-experiment	7.2±0.3	10.5			6.6±0.7	9.4		
7.	40-meter 7-stage run, s	Pre-experiment	33.8±1.9	12.1	4.7	<0.001	32.9±2.2	13.2	1.4	>0.05
		Post-experiment	30.2±4.1	14.5			32.3±4.2	12.3		

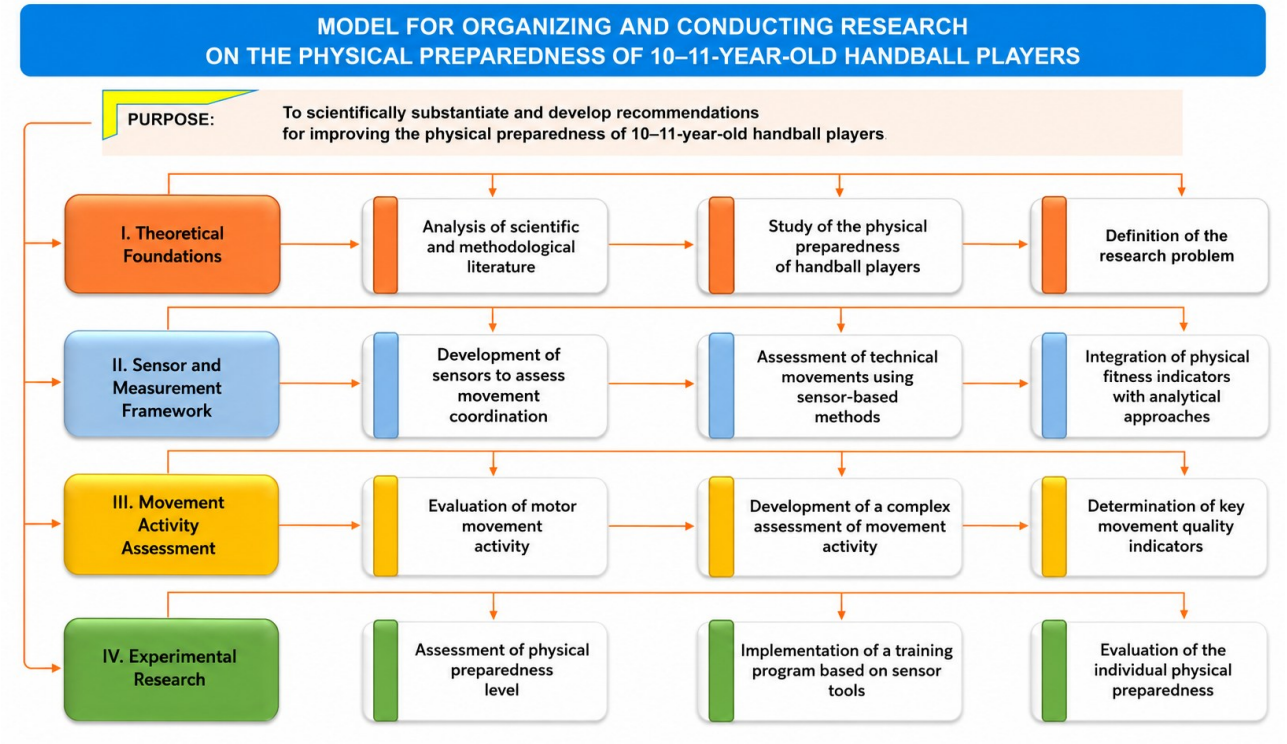
especially in competitions, it is not only physical conditioning that matters, but also psychological stability, stress resistance, motivation, and self-confidence, which play a crucial role. The athlete's mental state is analyzed using specialized psychological tests (e.g., "Measuring Stress Resistance Through a Questionnaire," "Motivation Level Test"). This data indicates whether the athlete requires an individualized approach.

Based on all the results obtained during the assessment stage, an individualized training program is developed for the athlete. For instance, if an athlete has high endurance but poor technique, they will be given more technique-focused training loads. Conversely, if their strength is adequate but their agility is lacking, the number of coordination exercises will be increased. This process allows the athlete to improve their weaknesses while further developing their strengths.

The Sensory System Activation and Coordination Development Stage—this stage ensures that athletes perceive their own bodies, precisely control their movements, and are prepared at a sensory level for competitive situations before they perfect their technique. For athletes of this age (10-11 years), psychomotor development is most active during this period, making this stage crucial. The sensory system activation and coordination development stage is a critical period that ensures the integrated development of the physical and nervous systems in athletes aged 10-11. The primary objective of this stage is to refine motor responses based on the child's perception of the external environment (vision, hearing, balance), enhance coordination, and form the skills to properly control their body's movement in space.

Balance and spatial awareness exercises: Exercises aimed at maintaining balance include standing on one leg, moving on a gently sliding platform, balancing with closed eyes, and exercises to prevent dizziness during circular movements or turns. These exercises develop an athlete's vestibular system and teach them to have a clear sense of their body in space. Quick reaction and decision-making exercises: In this type of exercise, athletes are instructed to act in unpredictable situations. For example, a coach shows a two-colored card; when red is shown,

Fig. Application of the model for developing the physical preparedness of handball players in the initial training stage



run left; when it's green, stop. Another example is a game-based drill: when an opponent moves with the ball in one direction, jump and block them in the opposite direction. This type of exercise develops adaptability to unexpected situations, reaction speed, and the ability to choose an immediate course of action. Coordination tests and assessment: Coaches assess the level of athletes' sensory and coordination development through tests, such as eye-tracking tests, the "snake run" (agility + direction), and reaction tests (to light or sound). Through this process, individual weaknesses are identified and training sessions are adjusted accordingly.

The process of teaching technical movements step-by-step is a pedagogical model for athletes, especially young athletes aged 10-11, to consciously execute, deliberately control, and subsequently automate these movements. This approach is based on achieving perfect mastery by breaking down any technical action into simple and understandable stages, rather than teaching it in its complex form all at once. This is because young athletes have not yet fully developed their ability to completely control their movements, their spatial awareness, their distribution of force, and their visual-motor coordination.

The application of phased training is an effective pedagogical approach that serves as a solid foundation for long-term preparation.

The first step of the initial stage is to break down the movement; that is, to teach the athlete the technical action by dividing it into segments. For example, in handball, the technique of catching and throwing the ball is divided into the following phases: 1) assuming the catching stance, 2) bringing the arm back, 3) establishing a base with the feet, 4) the throwing motion of the arm, and 5) maintaining balance after releasing the ball. Each component is taught at a simple and slow tempo. At this stage, the main focus is on the form of the movement and body coordination.

The second stage is inter-segmental integration, where the previously learned components are combined to form a complete movement. At this stage, the athlete learns to control the initiation and completion of the movement, along with its timing, force, and posture. This process activates the eye-hand coordination, muscle memory, and sensory systems. The movements are not yet fully automated but are consciously connected. Therefore, repetitive drills are used to enhance the stability, smoothness, and precision of the movements. Athletes typically make mistakes during this stage, and the coach's role is to identify and correct these errors.

The third stage is the automation of movement, meaning technical actions are performed reflexively, without the athlete's conscious control. To achieve this, the movements are repeated numerous times and under variable conditions (at different speeds, in various directions, and with changing resistance). For instance, the technique is practiced in competition-like scenarios through drills such as throwing the ball while walking, throwing against an opponent's resistance, or throwing the ball after a running jump. At this stage, the movements become embedded in the athlete's mind as internal motor patterns, enabling fast and effective action during competition.

The fourth stage is the integration of technique into game situations, meaning the learned movements are now applied in real sports scenarios. The athlete must be able to apply the technique against an active opponent, under time pressure, and while maintaining balance, all while performing other in-game movements. At this stage, the coach works on the athlete's decision-making speed, their ability to adapt the technique to the situation, and their combination of movements. For example, an athlete receives the ball, turns, gets past two opponents, jumps, and shoots—these actions are now performed intuitively. The scientific basis for this approach is that by learning a movement in parts, a motor pattern is formed in the athlete's brain. The correct formation of this motor pattern then guarantees its subsequent automatic, high-quality execution.

For young athletes, step-by-step training is conducted, particularly through visual methods, repetition, increasing difficulty, and making movements more complex. When working on a specific movement during a training session, the coach first explains it, then demonstrates it, after which the athlete performs it independently. Following that, the coach analyzes the performance and makes the necessary corrections. This method is implemented based on a "demonstrate – perform – analyze – reinforce" cycle.

Step-by-step instruction in technical movements is not merely a tool for mastering technique, but a comprehensive pedagogical process that develops an athlete's ability to move consciously, control their actions, make decisions, and conduct themselves in real game situations. For athletes aged 9–11 in particular, this approach is grounded in understanding the movement and fully aligns with didactic principles. Through this method, actions are not only performed but are also perfectly formed as a mental model, which creates a foundation for the athlete to perform effectively under competitive conditions.

Integrating physical qualities with the activity of sensory analyzers is the process of controlling an athlete's motor activity through sight, hearing, the vestibular system (balance), and spatial awareness. With this approach, the athlete does not just perform a movement but also controls, analyzes, and adapts it to the environment through their sensory organs. This integration is especially crucial in sports games: making the right decisions, sensing time and space, and precisely controlling movement are all achieved through the active functioning of sensory analyzers. Since the nervous system is highly plastic between the ages of 10 and 11, it is most effective to develop these skills during this period.

The stage of refining motor activity is where an athlete learns to integrate previously acquired technical, sensory, and physical skills in complex situations, adapt to circumstances, and act based on decision-making. This stage coincides with a period in 10-11-year-old athletes where the complexity, dynamics, and interconnectedness of their movements increase. In team sports especially, this stage plays a crucial role in developing correct actions under competitive conditions, game awareness, and tactical thinking.

Motor activity is the athlete's ability to move, coordinate, and control their body, performing movements with precision and efficiency. It develops by relying not only on muscular strength but also on a complex set of factors including the central nervous system, muscle memory, spatial perception, and motor automatism. Particularly in sports games, establishing these skills in childhood guarantees a technical advantage in the athlete's future career. The 10-11 age range is the most opportune stage for forming the fundamental principles of motor skills and for making them more complex. When working on movements, speed and agility emerge as key components. For example, the following drills are used in training sessions:

changing direction sharply by running in a "zigzag" pattern;

stopping abruptly while running and changing direction;

-dribbling the ball past an opponent by using a feint;

-stopping from a run by jumping and shooting the ball;

-running, stopping, and reaction tasks along complex routes;

To develop motor activity in young athletes, exercises that are performed under repetitive but variable conditions are used. This means that the same action (e.g., shooting a ball) is repeated in different situations (speed, resistance, position). Through this, the athlete's movement pattern is reinforced, becoming not just adapted to a single condition but a generalized reflex. It is this method that prepares an athlete to act without losing composure in any situation during a game.

-running in response to a light signal;

-shooting the ball based on a sound signal;

-changing position according to the opponent's movement.

Through these exercises, the athlete shortens the time between making a decision and taking action. This increases movement efficiency and elevates the athlete's level of dominance in the game. The "Development of Motor Activity" stage shapes the athlete's ability to perform movements accurately, smoothly, automatically, and effectively. At this stage, movements are made more complex, repeated under various conditions, and the skills for their sequential execution are strengthened. Reaction speed, body balance, coordination, and motor automatism are developed in unison. This serves as the foundation for shaping an athlete into a technically advanced, competitive, and psychologically stable individual.

The stage of complex motor activity development is the process of integrating all the technical, sensory, coordinative, and motor skills that an athlete has acquired in previous stages into a complex system of movement. In this stage, the athlete learns not just to perform individual actions, but to combine several movements simultaneously, adapt them to a real sports environment, and act effectively in rapidly changing conditions. This stage is particularly crucial for team sports such as handball, basketball, and football. At this stage, the coach organizes training sessions based on modular and combined blocks of movement. For example, dribbling the ball → turning against an opponent's resistance → jumping to shoot the ball → returning to position. Through the mutual integration of movements—by increasing their complexity—the athlete learns to manage multiple functions at once:

- maintaining body balance;
- controlling the ball;
- observing the opponent's movements;
- seeing open spaces;
- making quick and correct technical decisions;
- executing the action effectively.

These abilities are governed by the athlete's sensorimotor system, visual analyzers, reactive thinking, and motor automaticity. In other words, at this stage, the athlete receives information through their sensory organs, quickly analyzes it in the brain, and performs the necessary action reflexively—this is the essence of sports games.

Movement Efficiency and Energy Conservation—another crucial factor is that at this stage, athletes not only perform a movement but also strive to execute it in an energy-saving, economical, and fluid manner. For example, when throwing a ball, an optimal throw is achieved through the proper transfer of body weight, without using excessive force. This conserves the athlete's physiological resources, reduces fatigue, and ensures consistent results.

Special Physical Preparation - at this stage, an athlete's training is no longer limited to developing general physical qualities, but is focused on developing the specific (i.e., specialized) physical qualities required for their chosen sport. For example, for handball players, explosive power in jumping, quick turns, arm strength, and agility are considered special physical qualities. Therefore, training sessions are more focused on enhancing these qualities: Vertical jumps (for explosive starting power), Reactive runs (for speed and changing direction), Weighted arm exercises (for ball-throwing power), and "Start-stop" runs over short distances (for agility and braking). At this stage, it becomes crucial to develop energy systems in a way that is tailored to the sport. For instance, exercises are structured around high-power movements in a short period (anaerobic-phosphagen system) or 30-60 second game-like actions (anaerobic glycolytic). This helps the athlete's muscular activity, as well as their cardiovascular and respiratory systems, adapt to their chosen sport.

This methodology is designed for the gradual, systematic, and scientifically-grounded development of the technical and tactical skills of 10-11 year old athletes, specifically boys who

play handball. The methodological approach was developed by taking into account the athletes' stages of physical development, their psychophysiological states, and their adaptation processes to the sport. Within this framework, each stage is purposefully interconnected, representing a continuous path of development that begins with initial physical conditioning and progresses to the effective application of technical skills in competitive conditions. One of the key advantages of this methodology is that motor activity is developed not solely through muscular strength, but in harmony with sensory systems, decision-making abilities, and balanced motor automatism. Consequently, the methodology extensively utilizes exercises based on visual, auditory, and kinesthetic stimuli, along with coordination drills and tasks that require decision-based actions in game-like situations. At every stage, an individualized approach is applied, tailored to the age, physical potential, and psychological characteristics of the athletes, allowing each one to progress at their own developmental pace. Ultimately, this methodology serves to prepare athletes for competitive environments, enabling them to effectively apply their technical and tactical abilities under pressure, enhance the speed and quality of their decision-making, and build their capacity for independent action in sports games.

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The fourth area of focus is assessing the athlete's psychological preparedness and resilience. To succeed in sports training, and especially in competitions, it is not only physical conditioning that matters, but also psychological stability, stress resistance, motivation, and self-confidence, which play a crucial role. The athlete's mental state is analyzed using specialized psychological tests (e.g., "Measuring Stress Resistance Through a Questionnaire," "Motivation Level Test"). This data indicates whether the athlete requires an individualized approach.

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The third stage is the automation of movement, meaning technical actions are performed reflexively, without the athlete's conscious control. To achieve this, the movements are repeated numerous times and under variable conditions (at different speeds, in various directions, and with changing resistance). For instance, the technique is practiced in competition-like scenarios through drills such as throwing the ball while walking, throwing against an opponent's resistance, or throwing the ball after a running jump. At this stage, the movements become embedded in the athlete's mind as internal motor patterns, enabling fast and effective action during competition.

The fourth stage is the integration of technique into game situations, meaning the learned movements are now applied in real sports scenarios. The athlete must be able to apply the technique against an active opponent, under time pressure, and while maintaining balance, all while performing other in-game movements. At this stage, the coach works on the athlete's decision-making speed, their ability to adapt the technique to the situation, and their combination of movements. For example, an athlete receives the ball, turns, gets past two opponents, jumps, and shoots—these actions are now performed intuitively. The scientific basis for this approach is that by learning a movement in parts, a motor pattern is formed in the athlete's brain. The correct formation of this motor pattern then guarantees its subsequent automatic, high-quality execution.

For young athletes, step-by-step training is conducted, particularly through visual methods, repetition, increasing difficulty, and making movements more complex. When working on a specific movement during a training session, the coach first explains it, then demonstrates it, after which the athlete performs it independently. Following that, the coach analyzes the performance and makes the necessary corrections. This method is implemented based on a "demonstrate – perform – analyze – reinforce" cycle.

Step-by-step instruction in technical movements is not merely a tool for mastering technique, but a comprehensive pedagogical process that develops an athlete's ability to move consciously, control their actions, make decisions, and conduct themselves in real game situations. For athletes aged 9–11 in particular, this approach is grounded in understanding the movement and fully aligns with didactic principles. Through this method, actions are not only performed but are also perfectly formed as a mental model, which creates a foundation for the athlete to perform effectively under competitive conditions.

Integrating physical qualities with the activity of sensory analyzers is the process of controlling an athlete's motor activity through sight, hearing, the vestibular system (balance), and spatial awareness. With this approach, the athlete does not just perform a movement but also controls, analyzes, and adapts it to the environment through their sensory organs. This

integration is especially crucial in sports games: making the right decisions, sensing time and space, and precisely controlling movement are all achieved through the active functioning of sensory analyzers. Since the nervous system is highly plastic between the ages of 10 and 11, it is most effective to develop these skills during this period.

The stage of refining motor activity is where an athlete learns to integrate previously acquired technical, sensory, and physical skills in complex situations, adapt to circumstances, and act based on decision-making. This stage coincides with a period in 10-11-year-old athletes where the complexity, dynamics, and interconnectedness of their movements increase. In team sports especially, this stage plays a crucial role in developing correct actions under competitive conditions, game awareness, and tactical thinking.

Motor activity is the athlete's ability to move, coordinate, and control their body, performing movements with precision and efficiency. It develops by relying not only on muscular strength but also on a complex set of factors including the central nervous system, muscle memory, spatial perception, and motor automatism. Particularly in sports games, establishing these skills in childhood guarantees a technical advantage in the athlete's future career. The 10-11 age range is the most opportune stage for forming the fundamental principles of motor skills and for making them more complex. When working on movements, speed and agility emerge as key components. For example, the following drills are used in training sessions:

- changing direction sharply by running in a "zigzag" pattern;
- stopping abruptly while running and changing direction;
- dribbling the ball past an opponent by using a feint;
- stopping from a run by jumping and shooting the ball;
- running, stopping, and reaction tasks along complex routes;

To develop motor activity in young athletes, exercises that are performed under repetitive but variable conditions are used. This means that the same action (e.g., shooting a ball) is repeated in different situations (speed, resistance, position). Through this, the athlete's movement pattern is reinforced, becoming not just adapted to a single condition but a generalized reflex. It is this method that prepares an athlete to act without losing composure in any situation during a game.

- running in response to a light signal;
- shooting the ball based on a sound signal;
- changing position according to the opponent's movement.

Through these exercises, the athlete shortens the time between making a decision and taking action. This increases movement efficiency and elevates the athlete's level of dominance in the game. The "Development of Motor Activity" stage shapes the athlete's ability to perform movements accurately, smoothly, automatically, and effectively. At this stage, movements are made more complex, repeated under various conditions, and the skills for their sequential execution are strengthened. Reaction speed, body balance, coordination, and motor automatism are developed in unison. This serves as the foundation for shaping an athlete into a technically advanced, competitive, and psychologically stable individual.

The stage of complex motor activity development is the process of integrating all the technical, sensory, coordinative, and motor skills that an athlete has acquired in previous stages into a complex system of movement. In this stage, the athlete learns not just to perform individual actions, but to combine several movements simultaneously, adapt them to a real sports environment, and act effectively in rapidly changing conditions. This stage is particularly crucial for team sports such as handball, basketball, and football. At this stage, the coach organizes training sessions based on modular and combined blocks of movement. For example, dribbling the ball → turning against an opponent's resistance → jumping to shoot the ball → returning to position. Through the mutual integration of movements—by increasing their complexity—the athlete learns to manage multiple functions at once:

- maintaining body balance;
- controlling the ball;
- observing the opponent's movements;
- seeing open spaces;
- making quick and correct technical decisions;
- executing the action effectively.

These abilities are governed by the athlete's sensorimotor system, visual analyzers, reactive thinking, and motor automaticity. In other words, at this stage, the athlete receives

information through their sensory organs, quickly analyzes it in the brain, and performs the necessary action reflexively—this is the essence of sports games.

Movement Efficiency and Energy Conservation—another crucial factor is that at this stage, athletes not only perform a movement but also strive to execute it in an energy-saving, economical, and fluid manner. For example, when throwing a ball, an optimal throw is achieved through the proper transfer of body weight, without using excessive force. This conserves the athlete's physiological resources, reduces fatigue, and ensures consistent results.

Special Physical Preparation - at this stage, an athlete's training is no longer limited to developing general physical qualities, but is focused on developing the specific (i.e., specialized) physical qualities required for their chosen sport. For example, for handball players, explosive power in jumping, quick turns, arm strength, and agility are considered special physical qualities. Therefore, training sessions are more focused on enhancing these qualities: Vertical jumps (for explosive starting power), Reactive runs (for speed and changing direction), Weighted arm exercises (for ball-throwing power), and "Start-stop" runs over short distances (for agility and braking). At this stage, it becomes crucial to develop energy systems in a way that is tailored to the sport. For instance, exercises are structured around high-power movements in a short period (anaerobic-phosphagen system) or 30-60 second game-like actions (anaerobic glycolytic). This helps the athlete's muscular activity, as well as their cardiovascular and respiratory systems, adapt to their chosen sport.

This methodology is designed for the gradual, systematic, and scientifically-grounded development of the technical and tactical skills of 10-11 year old athletes, specifically boys who play handball. The methodological approach was developed by taking into account the athletes' stages of physical development, their psychophysiological states, and their adaptation processes to the sport. Within this framework, each stage is purposefully interconnected, representing a continuous path of development that begins with initial physical conditioning and progresses to the effective application of technical skills in competitive conditions. One of the key advantages of this methodology is that motor activity is developed not solely through muscular strength, but in harmony with sensory systems, decision-making abilities, and balanced motor automatism. Consequently, the methodology extensively utilizes exercises based on visual, auditory, and kinesthetic stimuli, along with coordination drills and tasks that require decision-based actions in game-like situations. At every stage, an individualized approach is applied, tailored to the age, physical potential, and psychological characteristics of the athletes, allowing each one to progress at their own developmental pace. Ultimately, this methodology serves to prepare athletes for competitive environments, enabling them to effectively apply their technical and tactical abilities under pressure, enhance the speed and quality of their decision-making, and build their capacity for independent action in sports games.

Conclusion

An analysis of scientific-methodological literature and practical experience on the development of physical and technical training for handball players in the initial preparation stage shows that scientific research has been conducted on developing various forms to increase the level of physical development and physical fitness of young athletes in the initial preparation stage. However, a systematic training methodology for developing the physical and technical training of handball players in the initial preparation stage has not been sufficiently studied, and this issue requires finding and implementing rational means and methods in training sessions.

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